

# We are IntechOpen, the world's leading publisher of Open Access books Built by scientists, for scientists

4,800

Open access books available

122,000

International authors and editors

135M

Downloads

Our authors are among the

154

Countries delivered to

TOP 1%

most cited scientists

12.2%

Contributors from top 500 universities



WEB OF SCIENCE™

Selection of our books indexed in the Book Citation Index  
in Web of Science™ Core Collection (BKCI)

Interested in publishing with us?  
Contact [book.department@intechopen.com](mailto:book.department@intechopen.com)

Numbers displayed above are based on latest data collected.  
For more information visit [www.intechopen.com](http://www.intechopen.com)



# Introductory Chapter: Computational Methods in Biomedical Engineering and Biotechnology

*Lulu Wang*

## 1. Introduction

Computers have significantly changed everyone's daily lives since the first computer came to the world. With the rapid development of medical care and biomedical technologies, the requirements for computational methods and programs in biomedical engineering and biotechnology are becoming higher and higher [1]. Traditional biomedical and clinical data collection and analysis methods are replaced by computer programs that can predict clinical decisions. As a result, more cost-effective and powerful computing methods and programs have been replaced by expensive equipment, tests, and examinations.

There is no doubt that a large number of biomedical and clinical data, such as signals and images, cannot be extracted by human eyes. The rapid development of computer programs has provided great help to solve such problems. Computer programs can truly simulate abstract models of specific or equivalent clinical systems [2]. Computer models have become a useful part of mathematical modelling of many natural systems, including psychology, physiology, biology, biomedicine and biotechnology, as well as all branches of bioengineering, in order to better understand the work of the systems mentioned above.

With the fast development of biomedical engineering, electronics and computer technologies, computational methods and programs have attracted much interest in biomedical signal and imaging processing over the past 2 decades [3–5]. Effective computational approach and devices need to be developed to analyse complex data and to provide clinician and health care providers a prominent recommendation and prediction. The applications of computer methods and programs in biological signals and imaging have attracted the attention of researchers all over the world. Many computational methods and devices have been proposed, tested, implemented and analysed in biotechnology and biomedical engineering applications. Although the application of computer methods and programs has both advantages and disadvantages. Obviously, they have more advantages than their limitations, and it is certain that computer methods and programs will dominate all fields of biomedicine and bioengineering.

With the design of more advanced computer methods and programs, it is expected that the methods and equipment for processing the data generated by these systems need to be improved accordingly. These new methods not only help to extract new knowledge, which is difficult to obtain from existing traditional interpretations, but also lay a foundation for providing fast prediction information

and helping clinicians make better clinical decisions. As shown in the chapters, these changes need to address both the size and complexity of the generated data.

The book 'Computer Methods and Programs in Biomedical Signal and Image Processing' aims to provide a brief update to the current status of and advances in the computer methods and programs used for the development of the theory and practice of biomedical signal and image communication. The book comprises a collection of invited manuscripts, written in a convenient way and manageable length. These timely collections will provide an invaluable resource for initial enquiries about technologies and encapsulating the latest developments and applications with reference sources for further detailed information. The methods described in this book cover a wide range of computational algorithms that are widely used in bioengineering and biomedicine. The content and format are specifically designed to stimulate the further development and application of these technologies by reaching out to the non-specialist across a wide audience.

This book is intended to expose the latest developments of scientists and engineers, covering a variety of complementary topics, with a view to enhancing people's overall understanding of the computer science and biomedical image communications. It will benefit students, scientists and researchers in applied computer science. Engineers and clinicians working in imaging will also find this book very useful. I hope you will enjoy this book.

## **Author details**

Lulu Wang  
School of Instrument Science and Opto-electronics Engineering,  
Hefei University of Technology, China

\*Address all correspondence to: [luluwang2015@hfut.edu.cn](mailto:luluwang2015@hfut.edu.cn)

## **IntechOpen**

© 2019 The Author(s). Licensee IntechOpen. This chapter is distributed under the terms of the Creative Commons Attribution License (<http://creativecommons.org/licenses/by/3.0>), which permits unrestricted use, distribution, and reproduction in any medium, provided the original work is properly cited. 

## References

[1] Hii PC, Chung WY. A comprehensive ubiquitous healthcare solution on an android™ mobile device. *Sensors*. 2011;**11**:6799-6815

[2] Hosseini SAH, Sohrabpour A, He B. Electromagnetic source imaging using simultaneous scalp EEG and intracranial EEG: An emerging tool for interacting with pathological brain networks. *Clinical Neurophysiology*. 2018;**129**(1):168-187

[3] Jin KH, Mccann MT, Froustey E, Unser M. Deep convolutional neural network for inverse problems in imaging. *IEEE Transactions on Image Processing*. 2017:1-1

[4] Braojos R, Bortolotti D, Bartolini A, Ansaloni G, Benini L, Atienza D. A synchronization-based hybrid-memory multi-core architecture for energy-efficient biomedical signal processing. *IEEE Transactions on Computers*. 2017;**66**(4):575-585

[5] Mitov IP. A method for assessment and processing of biomedical signals containing trend and periodic components. *Medical Engineering and Physics*. 1998;**20**(9):660-668